Docket No.: 043890-0700 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Customer Number: 53080
Daisuke ADACHI	:	Confirmation Number: 4951
Application No.: 10/511,749	:	Group Art Unit: 1795
Filed: October 19, 2004	:	Examiner: RAYMOND, Brittany L.

For: PLASMA DISPLAY PANEL MANUFACTURING METHOD

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the non-final Office Action dated October 13, 2010, having a three-month shortened statutory period for reply set to expire on January 13, 2011, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper. This listing of claims replaces all prior versions, and listings, of claims in the application.

Remarks begin on page 4.

AMENDMENTS TO THE CLAIMS

Please enter the following amendments:

1. (Previously Presented) A method of manufacturing a plasma display panel, in which a plurality of structures of the plasma display panel are formed with photolithography, wherein a position on a photosensitive material corresponding to one of the structures of the plasma display panel is exposed twice using successive first and second exposures, each of the structures extends primarily in a lengthwise direction and has a width w in a widthwise direction orthogonal to the lengthwise direction, and a photomask and the photosensitive material are moved in the widthwise direction relative to each other by a distance less than w between the first and second exposures.

2. (Currently Amended) A method of manufacturing a plasma display panel, in which a plurality of electrodes, disposed periodically with a pitch p, of the plasma display panel are formed with photolithography, wherein a position on a photosensitive material corresponding to one of the electrodes is exposed twice using successive first and second exposures, exposure parts of a photomask for forming the electrodes are disposed periodically with [[a]] the pitch p, and a photomask and the photosensitive material are moved relative to each other by two or more integral times the distance p between the first and second exposures.

3 – 7. (Canceled)

8. (Previously Presented) The method according to claim 1, wherein the structures are address electrodes formed by exposing a photosensitive silver paste polymerized by exposure to light.

9. (Previously Presented) The method according to claim 2, wherein the electrodes are address electrodes formed by exposing a photosensitive silver paste polymerized by exposure to light.

10 – 12. (Canceled)

REMARKS

Claims 1, 2, 8, and 9 are currently pending in this application. By this response to the non-final Office Action dated October 13, 2010, claim 2 is amended. Support for the amendments is found in the specification, including the claims, as filed. No new matter has been introduced. Favorable reconsideration of the application in light of the foregoing amendments and following comments is respectfully solicited.

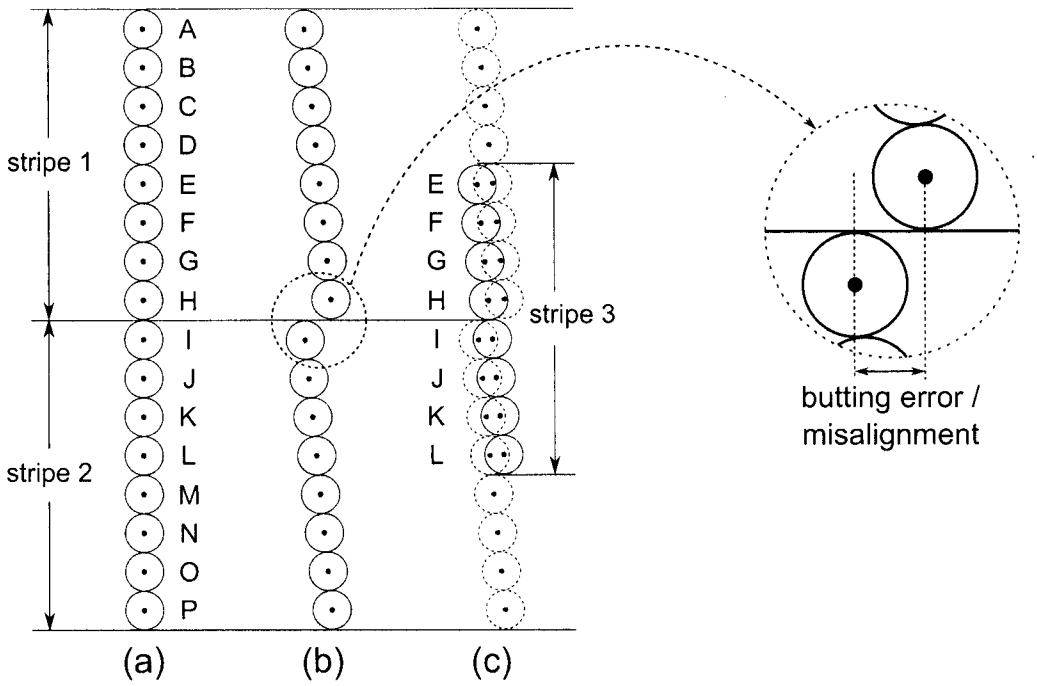
In section 3 of the Office Action, claims 1 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,008,166 (Aoki) in view of Rieger, Michael L., et al., "Image Quality Enhancements for Raster Scan Lithography," Optical/Laser Microlithography, Proc., SPIE Vol. 922 (1988), pp. 55-64 (Rieger) and U.S. Patent App. Pub. No. 2003/0215747 (Kim). In section 4 of the Office Action, claims 2 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoki in view of U.S. Patent App. Pub. No. 2004/0076889 (Huang) and Kim. Applicant respectfully traverses.

Claim 1

The Office Action expressly acknowledges that "Aoki fails to disclose that the mask and substrate are moved relative to one another such that the movement is less than the width of one of the elements" (Office Action, page 3, lines 6-7). Applicant respectfully notes that this presentation of the claim limitations is not accurate, as claim 1 expressly recites that "a photomask and the photosensitive material are moved in the widthwise direction relative to each other by a distance less than w between the first and second exposures," where "the structures extend[] primarily in a lengthwise direction and has a width w in a widthwise direction orthogonal to the lengthwise direction."

The Office Action seeks to bridge the acknowledged gap between claim 1 and Aoki by relying on Rieger. However, the Office Action, at page 3, lines 11-12, incorrectly indicates that "Rieger discloses a process of printing a feature twice onto a substrate and shifting the mask by half a width of the feature in between the two exposures." Rieger's process is instead specifically adapted to an exposure system that does not use a mask – specifically, "[r]aster scan lithography systems, such as scanned-laser and most E-beam mask writers, [which] produce images through a mosaic of discrete picture elements (pixels)" (Rieger, page 55, Abstract). In the type of system shown in Rieger, Figure 19 and discussed on pages 62-63, a substrate is exposed in "stripes" that are more than one pixel wide. See, for example, U.S. Patent No. 4,796,038 (to the same ATEQ Corporation whose employees authored the Rieger article), illustrating use of a stripe 8 pixels wide.

The portion of Rieger at the bottom on page 62 relied upon by the Office Action (*see* Office Action, page 3, lines 12-13 (citing Rieger at "Page 62, last paragraph")) describes a "butting error caused by a fixed tilt in the raster scan direction." The described fixed tilt and resultant butting error are illustrated in the below drawing. Ideally, as shown in (a), the scanning head used to form a stripe is aligned perpendicular (vertically, as shown below) to the direction in which the stripe extends (horizontally, as shown below). However, as shown in (b), the scanning head may be tilted (greatly exaggerated similar to as shown in Rieger, Figure 19 for the sake of illustration). Where there is a tilt as shown in (b) and Rieger, Figure 19(a), "[f]eatures in adjacent raster patterns will have a fixed misalignment" (Rieger, page 62). This misalignment can be seen in the difference in the continuity of the patterns formed by stripes 1 and 2 between (a) and (b) below. To address this problem, Rieger discloses scanning with an additional stripe (stripe 3 shown below, or the "pass 2 stripe" shown in Rieger, Figure 19(b)).



Rieger's technique does not bridge the gaps between claim 1 and Aoki, and does not make claim 1 obvious, for at least the following reasons:

(1) Rieger does not use a mask. Instead, it is forming the pattern on the substrate pixel by pixel. Thus, the Office Action incorrectly states that "Rieger discloses a process of . . . shifting the mask." Additionally, raster scan lithography would not have been considered a reasonable technique for forming a large structure such as a plasma display panel. Further, Rieger's technique does not relate to the use of a mask for exposing a device substrate as described in Aoki.

(2) Rieger's technique is used to overcome an alignment error between adjacent raster-scanned stripes due to a scanning head not being perpendicular to the stripe direction. Where, as recited in claim 1, a mask is being used, no such error occurs. Thus, Rieger's technique does not relate to the subject matter recited in claim 1.

(3) The Office Action also incorrectly indicates that "Rieger discloses a process of . . . shifting . . . by half a width of the feature in between the two exposures." Instead, Rieger discloses shifting with respect to the stripe width, which has no relationship to the width of a plasma display structure.

(4) Claim 1 recites that "the structures extend[] primarily in a lengthwise direction and ha[ve] a width w in a widthwise direction orthogonal to the lengthwise direction," and that "a photomask and the photosensitive material are moved in the widthwise direction relative to each other by a distance less than w." In contrast, the structure shown in Rieger, Figure 19 extends primarily in the vertical direction, and the shifting of the scanning head cited by the Office Action occurs in the same vertical direction – not in a widthwise direction orthogonal to the lengthwise direction as recited in claim 1.

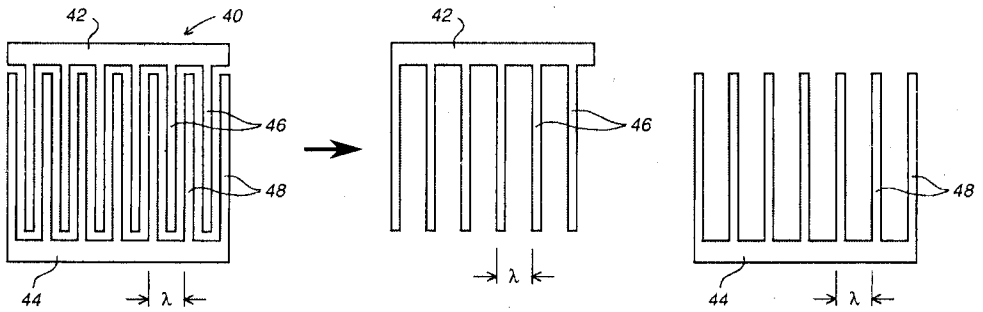
(5) Rieger, at the top of page 63, explains "that to keep the pixel data in the correct place relative to the substrate, the data within each stripe must be shifted in a direction opposite to the direction of stripe shift." This means, as illustrated in the above drawing, that where pixels data A-H is formed in stripe 1, and pixel data I-P is formed in stripe 2, if one considers that stripe 3 is formed by shifting stripe 1 in the downward direction, the pixel data is shifted upward (i.e., the "direction opposite to the direction of stripe shift") such that stripe 3 contains pixel data E-L. Thus, for example, pixel data H is always formed at the boundary between stripes 1 and 2, whether rendered as part of stripe 1 or stripe 3. This is different from when "a photomask and the photosensitive material are moved . . . relative to each other," as recited in claim 1.

Thus, Rieger fails to bridge the gaps expressly acknowledged by the Office Action between claim 1 and Aoki. Kim, which page 7, lines 20-21, of the Office Action describes as being "relied upon to teach that the process can be used to form address electrodes, and that the photosensitive layer can contain silver powder," also fails to bridge these gaps. Thus, independent claim 1 is not obvious in view of the cited art. Accordingly, Applicant respectfully request withdrawal of the rejection of claims 1 and 8.

Claim 2

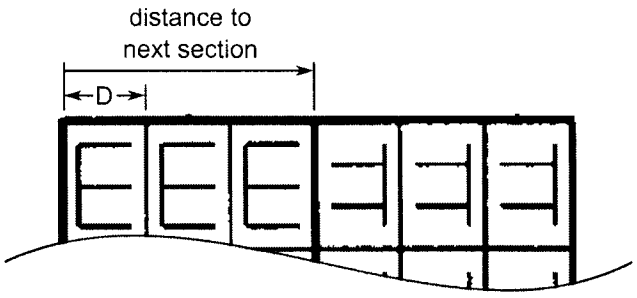
The Office Action expressly acknowledges that "Aoki fails to disclose that the mask and substrate are moved relative to one another such that the movement is greater than two pitches between the mask elements." Applicant respectfully notes that this presentation of the claim limitations by the examiner is not accurate, as claim 2 recites "exposure parts of a photomask for forming the electrodes are disposed periodically with a pitch p, and a photomask and the photosensitive material are moved relative to each other by two or more integral times the distance p between the first and second exposures." Movement by an integral multiple of p in the claimed subject matter is significant, as it ensures there are fully overlapping exposures by the "exposure parts of a photomask for forming the electrodes are disposed periodically with a pitch p," as recited in claim 2.

To better understand the technique described in Huang, it is helpful to review U.S. Patent No. 5,972,568 (Seniuk), which is discussed at Huang, paragraphs [0015]-[0019]. Seniuk, FIG. 7 shows surface wave device IDT 40 comprising interdigital fingers 46 and 48. Due to the close spacing of the interdigital fingers, diffraction effects limit the spacing between the fingers, which consequently limits the frequency at which the surface wave device can operate. As explained by Seniuk, at col. 5, line 25 to col. 5, line 46, the limitation imposed by diffraction effects is overcome by splitting the exposure pattern for IDT 40 into to separate mask patterns: one containing fingers 46, and the other containing fingers 48. This increases the spacing between the fingers produced in each mask pattern, which decreases the effect of diffraction (*see* Seniuk, col. 6, lines 11-19). However, by splitting the structure into two separate mask portions, there are "two exposure steps 12a and 12b instead of one" (Seniuk, col. 6, lines 59-60). *See also* Huang, paragraph [0016] (discussing the lithography process disclosed in Seniuk and summarized above).



Huang utilizes much the same two-exposure technique for overcoming diffraction effects in producing a surface wave device, as can be seen in Huang, FIG. 4, in which there is mask section 31 (corresponding to Seniuk, FIG. 8b) and mask section 32 (corresponding to Seniuk, FIG. 8a). Page 5, lines 8-17 of the Office Action indicates that in "Figure 4 . . . there are three of the same patterns next to one another and there would be a small pitch between each 'E' pattern.

. . . the three patterns are moved to the next section, which is greater than one of the pitches between the mask patterns, as recited in claim 2."



Huang's technique does not bridge the gaps between claim 2 and Aoki, and does not make claim 2 obvious, for at least the following reasons:

(1) The Office Action incorrectly indicates that claim 2 recites movement "greater than two pitches between the mask elements" (*see* Office Action, page 5, lines 4-5 and 16-17). Instead, claim 2 recites "a photomask and the photosensitive material are moved relative to each other by two or more integral times the distance p." Thus, the conclusion by the Office Action at page 5, lines 15-17, that "the three patterns are moved to the next section, which is greater than one of the pitches between the mask patterns," fails to demonstrate the subject matter actually recited in claim 2 is obvious.

Even if, for the sake of argument, the "E"-shaped structures shown in first section 31 in FIG. 4 were disposed periodically (which is not described in the written portion of Huang), Huang does not disclose or suggest that the distance moved between first and second exposures described in Huang, paragraph [0035] is an integral multiple of the distance D shown in the above drawing. Although the Office Action does not address the "integral" limitation of claim 2, were the examiner to suggest this is the case would be a result of improper hindsight – as it was not disclosed or suggested by Huang.

(2) Huang utilizes first and second exposure patterns that are specifically designed so as to not expose a position of photosensitive material twice (*see* Seniuk, FIGS. 7, 8a, and 8b, in which the patterns in 8a and 8b are disjoint; *see also* Huang, paragraph [0030] (discussing "two equally divided symmetrical patterns located on two sections of the same mask substrate")). Thus, Huang's technique does not relate to the claimed exposure process "wherein a position on a photosensitive material corresponding to one of the electrodes is exposed twice using successive first and second exposures." Thus, even if Huang shows moving a mask between first and second exposures, Huang does not suggest modifying Aoki to yield the claimed subject matter.

(3) Page 6, lines 11-15 of the Office Action indicates it would have been obvious to combine Huang with Aoki "because Huang teaches that this enhances the resolution of the exposure process." However, Huang's resolution enhancement is not a result of simply moving a mask a particular distance, but is also particular to the structure being exposed.

> As described in, for example, Huang, paragraph [0016], resolution is enhanced in Huang by reducing diffraction effects by taking an existing pattern with elements spaced at 0.4 μm, and dividing the pattern into two parts such that each part has alternating pattern elements spaced at a greater distance of 0.8 μm, as also illustrated by Seniuk, FIGS. 7, 8a, and 8b, and discussed above. In other words, Huang takes a dense pattern with period of p at which diffraction effects are significant, and splits it into two separate and less dense patterns with period 2p to reduce the effect of diffraction. The Office Action does not demonstrate that a electrode pattern of a plasma display panel suffers from diffraction effects during mask exposure as encountered in fabricating Huang's surface wave device. For example, Kim, in Tables 1 and 2, describes a device with a resolution of 20-30 μm. Nor does the Office Action explain how a 2-part mask solution as described by Huang would have been applied to Aoki to yield what is claimed, particularly without the benefit of hindsight afforded by the instant application.

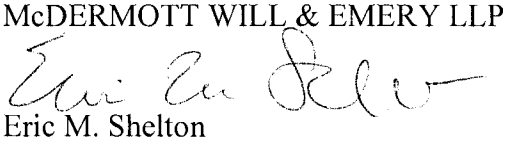
Thus, Huang fails to bridge the gaps expressly acknowledged by the Office Action between claim 2 and Aoki. Kim, which page 7, lines 20-21, of the Office Action describes as being "relied upon to teach that the process can be used to form address electrodes, and that the photosensitive layer can contain silver powder," also fails to bridge these gaps. Thus, independent claim 2 is not obvious in view of the cited art. Accordingly, Applicant respectfully request withdrawal of the rejection of claims 2 and 9.

In view of the above remarks, Applicant respectfully submits that the application is in condition for allowance, and respectfully requests the Examiner's favorable reconsideration as to allowance. The Examiner is invited to contact the Applicant's representative listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



Eric M. Shelton
Registration No. 57,630

Please recognize our Customer No. 53080 as our correspondence address.

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 EMS:MWE
Facsimile: 202.756.8087
Date: January 13, 2011